Spontaneous Tumors of the Adrenal Cortex in a Castrated Male Rat

Jacob Heiman, M.D.

(From the Department of Cancer Research, College of Physicians and Surgeons, Columbia University, New York 32, N. Y.)

(Received for publication March 13, 1944)

Spontaneous neoplasms of the adrenal gland in rats are rare. Bullock and Curtis (1) and Curtis, Bullock, and Dunning (2) found four spontaneous tumors of the left adrenal among 31,868 autopsied animals over a number of years. Three of the growths were described as adenomas, and one as a possible cortical cell carcinoma. Ratcliffe (12) found one adrenal adenoma among 237 tumor-bearing rats in a group of over 17,000 animals. Hueper and Martin (10) reported a tumor of the medulla in a castrated male rat fed on a diet deficient in vitamin E. Adrenal tumors are rare in other animals also. Fox (4) mentions among the autopsy findings on 1860 animals (1901-1923) the occurrence of an adrenal adenocarcinoma in a polar bear and a hypernephroma in a California seal. Itami (11) described an adenoma of the left suprarenal in an old female mouse from which an adenocarcinoma in the left axilla had been removed. Haaland (6) reported a spontaneous hypernephroma in the region of the left kidney in a male mouse 22 months old, and Tyzzer (14) two possible hypernephromas in two old female mice. Woolley and his associates (3, 15, 16, 17) found hyperplasia and carcinoma of the adrenal cortex in male and female mice castrated at birth and Gardner (5), also, has reported the occurrence of adrenal tumors in ovariectomized mice. Spiegel (13) found hyperplasia and tumors of the adrenal cortex in guinea pigs castrated at an early age.

The adrenal tumors herein described were observed during routine autopsy on a castrated male rat (R342, No. 5) 22 months old, weighing 445 gm. The animal was one of a series in which mammary fibroadenoma had been subcutaneously implanted (7), both before and after castration. Four other animals of the same series, weighing between 250 and 340 gm, each, grew large fibroadenomas and had small pale yellow adrenals. Rat 5 did not grow any subcutaneous tumors either before or after castration. At autopsy no trace of the subcutaneous implants was found.

Both adrenals and the pituitary were noticeably enlarged. The left adrenal showed a large cyst, which had displaced or destroyed the medulla and was filled with a finely granular material (Fig. 1). Between cortex and medulla an irregular dark-staining adenomatous tumor surrounded and projected into the cyst. Several smaller cystic areas occurred in the substance of the tumor.

The right adrenal showed a similar adenomatous structure in the juxtamedullary part of the cortex, pushing the medulla to one side (Fig. 2). The tumors, although located centrally, were not new growths of the medulla since the latter was displaced toward the periphery of the gland (Fig. 2), where it was distinctly visible. The cortex showed scattered small cystic areas and evidence of compression (8).

The tumors consisted of compact glands made up of large cuboidal or oval cells (Fig. 3). The cytoplasm was finely granular and the nuclei showed all stages of active mitoses (Fig. 4). There was a close resemblance between these cells and those seen in corpora lutea, and also certain cells in the anterior pituitary gland of castrates. In addition, the pituitary of this rat showed cystic degeneration and numerous castration cells (9).

DISCUSSION

The male rat in which the adrenal cortical adenomas appeared spontaneously had been castrated at 18 months of age and was resistant to tumor transplantation before and after castration. Castrated males of the same series that grew transplanted benign subcutaneous tumors showed normal but involuted adrenals. No conclusion can be drawn from the appearance of adrenal adenomata in a castrated male resistant to the growth of implanted mammary tumors. However, further investigations are advisable in old animals, as all other reported adrenal tumors appeared in old animals.

CONCLUSION

An adrenal cortical adenoma is described in an old castrated male rat resistant to subcutaneously implanted mammary fibroadenoma.
Fig. 1.—Left adrenal gland in an old castrated male rat. Adenoma with cystic degeneration, in juxtamedullary zone. × 48.

Fig. 2.—Right adrenal in same rat. Adenoma replacing juxtamedullary zone. Medulla pushed aside, between tumor and cortex. × 48.

Fig. 3.—Adenoma of rat adrenal. Large cells with granular cytoplasm, dark-staining nuclei. × 300.

Fig. 4.—Higher magnification. Nuclei show active mitoses. × 600.
REFERENCES

Spontaneous Tumors of the Adrenal Cortex in a Castrated Male Rat

Jacob Heiman

Cancer Res 1944;4:430-432.